

GARAGE DOOR REINFORCEMENT DEVICE

Field of the Invention

This invention is directed to garage door reinforcement and, in particular, to a securement device especially suited for providing auto-engaging reinforcement to a garage door.

Background of the Invention

Windstorms, such as tropical storms, tornados, storm bursts and hurricanes may place severe stress on buildings which, if left unchecked, can lead to property damage and loss of life. These storms may be slow moving providing time to prepare, or fast moving leaving very little time to prepare. In either case, high-velocity winds are often strong enough to remove roofs from buildings by breaching the building structure. Even if the roof and walls of a building are sufficiently strong to resist the winds produced by a storm, the building aperture covers, such as garage doors, often fail. Many devices have been developed to protect building aperture covers against damage from windstorms. Some of these devices are easier to install or operate than others, but all devices known require some type of manual action in order to provide reinforcement to the aperture cover. Therefore, if the homeowner is away or is not able to

1 install the protective device due to a time constraint, the
2 structure will not be properly protected from a storm.

3 The largest aperture cover in the typical home is the
4 garage door, some having a horizontal span exceeding 16 feet.
5 High wind loads cause these large aperture covers to deflect
6 across their unsupported spans. Once the aperture cover
7 exceeds a given amount of deflection the cover will buckle or
8 break. When a covering such as the garage door buckles under
9 high wind loads, the garage is instantly pressurized. This
10 often leads to a "domino" failure of the entire building
11 structure. The instant pressurization of the garage causes
12 the garage roof to be blown off the house. Once the garage
13 roof blows off, the remaining roof blows off the house and
14 the walls cave inward.

15 The proper use of reinforcement during high wind loads
16 can effectively prevent the failure of a wide span garage
17 door. Smaller building aperture covers may be sufficiently
18 reinforced against buckling by installing a secondary fixed-
19 panel over the aperture, for example, sheets of plywood
20 anchored against the aperture periphery. Corrugated panels
21 of aluminum or other rigid materials, removably mounted on
22 permanent tracks, are used in other situations. These
23 reinforcement methods are suitable for relatively small
24 apertures. However, since these types of reinforcement

1 panels do not collapse, they must be removed and stored when
2 not in use. Weight and space requirements quickly become
3 prohibitive factors as the size of the aperture to be covered
4 increases. Panels sized to cover large windows or garage
5 doors may be too heavy and cumbersome to move by a single
6 person. The need for two-person installation severely limits
7 the usefulness of this reinforcement method; a second person
8 may not be available when a storm approaches, possibly
9 preventing proper installation.

10 Folding, accordion-style panels are used as a way to
11 address some of the shortcomings found in fixed-panel
12 reinforcement methods. Folding panels typically require
13 installation of one or more permanent guide tracks and are
14 not suitable in all instances. For example, since accordion-
15 style reinforcement devices are folded, not removed, during
16 storage, sufficient space is required on either side of the
17 aperture to accommodate the folded panels. Additionally,
18 these types of reinforcing devices are often exposed to
19 weather and require preventive maintenance to ensure that the
20 stored panels will unfold easily and travel along the guide
21 tracks when needed. Furthermore, folding-panel reinforcement
22 devices are typically custom made, requiring specialized
23 equipment and many hours of labor for production and

1 installation. This tends to make folding panel reinforcements
2 expensive.

3 Other known storm protection devices, permanently attach
4 to the inside of garage doors, or are braces installed before
5 a storm. These devices require manual engagement or
6 installation. Manual engagement or installation is not
7 always possible. Homeowners are often not capable of moving
8 or installing these devices and there is likely to be a
9 shortage of contractors available before a major storm
10 capable of completing the installation. The limited amount
11 of time available before a storm may leave some of the people
12 who own this type of protective device without protection.

13

14 **DESCRIPTION OF THE PRIOR ART**

15 Devices that have been developed specifically to support
16 garage doors include U.S. Patent Nos. 3,708,917; 3,815,943;
17 3,891,021; 4,996,795; 5,205,096; 5,331,786; 5,337,520; and
18 5,371,970. Each discloses garage door supporting devices.
19 However, these devices do not lower the stresses placed on
20 the door mounting hardware and do not protect the reinforced
21 door against damage from sustained wind loads. Additionally,
22 these devices each require skill during installation.

23 U.S. Patent No. 5,706,877 discloses a locking and
24 reinforcing mechanism for a garage door wherein each door

1 panel includes a set of telescoping tubes. To engage the
2 protective device the operator must remove pins and manually
3 slide the inner tube from one panel across to the next panel
4 and replace the pin. After the device is engaged the door
5 cannot be opened until the device is disengaged. To
6 disengage the device the pin must again be removed, the inner
7 tube returned to its original position, and the pin replaced
8 to retain the tube.

9 U.S. Patent No. 5,732,758 requires hand engagement and
10 disengagement, and remains secured to a door even when not
11 used. Although this arrangement is suitable for many
12 settings, permanently attached reinforcement members add
13 extra weight that may be undesirable in some cases.

14 The assignee recognized the shortcomings and developed a
15 garage door reinforcement device for hurricanes. U.S. Patent
16 Nos. 6,385,916 reduces undesirable weight permanently
17 attached to a garage door. This device provides proven
18 protection against high wind loads, passing Miami Dade
19 hurricane tests. Further, this device provides excellent
20 support for older unreinforced doors. However, the device
21 must be installed and removed by hand. Current construction
22 regulations require the installation of stronger garage
23 doors, thus, the overall support provided by the '916 patent
24 can be reduced without reducing effectiveness.

1 None of the above noted devices is capable of providing
2 protection to an aperture opening without some type of hand
3 installation or engagement to utilize the device.

4 Thus, what is needed is an aperture cover reinforcement
5 device that includes advantages of the known devices, while
6 addressing the shortcomings they exhibit. The reinforcement
7 device should passively operate, being automatically engaged
8 and disengaged. The reinforcement device should also provide
9 support against damage from both positive and negative wind
10 loads. The reinforcement device should also allow unhindered
11 operation of the garage door and not hinder ingress or egress
12 of the aperture opening.

13

14 **SUMMARY OF THE INVENTION**

15 The present invention a reinforcement device suited for
16 bracing a building aperture cover, such as a garage door; the
17 device automatically engages when the aperture cover is
18 lowered and disengages when the door is raised. The device
19 employs at least one upper anchoring element, cooperating
20 with the door header, and one lower anchoring element,
21 cooperating with the floor structure. Both the upper and
22 lower elements are securely attached to aperture cover so
23 that they effectively divide and support the span of the
24 aperture. A metal hook and wire rope loop arrangement is

1 utilized in the upper elements while an engagement pin
2 employing a tongue and groove arrangement is utilized in the
3 lower element. The device is capable of providing protection
4 against both positive and negative pressure wind-loads.

5 More particularly, the upper element includes an
6 adjustable bracket assembly, a flexible wire rope loop, and a
7 hook member. The bracket assembly includes two L-shaped
8 elements having one leg adjustably attached to each other via
9 bolts, screws, or a similar fastener to allow vertical
10 adjustment of the bracket assembly with respect to the
11 substantially parallel first and second ends. The first end
12 of the bracket assembly is suitably attached to the top strut
13 of the garage door via bolts, screws, or a similar fastener.
14 The metal cable loop is constructed from a length of flexible
15 wire rope, having each end attached to the second end of the
16 bracket assembly to form a loop configuration defining an
17 aperture. The metal hook member is attached to the aperture
18 header so that it substantially aligns and cooperates with
19 the wire rope loop.

20 The lower anchoring element includes an engagement pin
21 and an anchor plate. The engagement pin is suitably attached
22 to a mounting plate, such as by weldment, and attached to a
23 vertical intermediate stile of the aperture cover via bolts,
24 screws, or a similar fastener. The floor-mounted anchor

1 plate includes a pin insertion aperture that accommodates the
2 engagement pin. Below the insertion aperture is a suitable
3 relief pocket in the floor for pin insertion. Bracing
4 grooves disposed around the circumference of the first end of
5 the engagement pin, engage corresponding pin passthrough
6 aperture edges, as a tongue and groove arrangement, when the
7 pin shifts laterally, as when a door reinforced by the
8 present invention is subjected to wind loads. In this
9 manner, the bracing notches prevent vertical motion of the
10 support post during use.

11 Because the device is automatically engaged, the
12 operator merely needs to lower the garage door to provide
13 reinforcement. As the garage door is lowered the wire rope
14 loop travels downward with respect to the metal hook member
15 and the metal hook engages the wire rope loop aperture while
16 the lower element engagement pin travels downward and is
17 directed into the pin insertion aperture disposed in the
18 lower anchor plate. As the garage door comes to rest on the
19 garage floor surface, the device assumes a securing
20 orientation that prevents unwanted movement of the aperture
21 cover.

22 Thus, it is an objective of the instant invention to
23 provide a reinforcement device for an upward opening aperture
24 covering that is automatically engaged.

1 Another objective of the instant invention is to provide
2 a reinforcement device for an upward opening aperture
3 covering that provides support against damage from both
4 positive and negative wind loads.

5 A further objective of the instant invention is to
6 provide a auto-engaging reinforcement device for an upward
7 opening aperture cover that minimizes the deflection of an
8 aperture covering during high wind-loads.

9 An additional objective of the instant invention is to
10 provide a auto-engaging reinforcement device that allows
11 unhindered operation of the secured aperture cover.

12 Yet another objective of the instant invention is to
13 provide a auto-engaging reinforcement device that does not
14 require removal or storage between uses.

15 Still another objective of the instant invention is to
16 provide an auto-engaging reinforcement kit which is suitable
17 for installation on new as well as existing upward opening
18 aperture covers.

19 Other objectives and advantages of this invention will
20 become apparent from the following description taken in
21 conjunction with the accompanying drawings wherein are set
22 forth, by way of illustration and example, certain
23 embodiments of this invention. The drawings constitute a
24 part of this specification and include exemplary embodiments

1 of the present invention and illustrate various objects and
2 features thereof.

3

4 **BRIEF DESCRIPTION OF THE DRAWINGS**

5 Figure 1 is a pictorial view showing the inside of a
6 garage door in a secured orientation with the reinforcement
7 device of the present invention in place;

8 Figure 2 is a section view of the garage door in figure
9 1 along lines 1-1, illustrating the cooperative engagement
10 between the present invention and the building structure;

11 Figure 3 is a close-up view of the upper anchoring
12 element shown in Figure 1;

13 Figure 4 is a close-up view of the lower anchoring
14 element shown in Figure 1;

15 Figure 5 is a partial section view of the lower
16 anchoring element of Figure 4, showing the tongue and groove
17 arrangement in an engaged orientation;

18 Figure 6 is an alternative embodiment of the lower
19 anchoring element allowing for the cooperative engagement
20 point between the engagement pin and the floor to be spaced
21 inwardly from the back side of the aperture cover;

22 Figure 7 is an alternative embodiment of the lower
23 anchoring element wherein the engagement pin is spring loaded
24 in an extended position to prevent damage to a vehicle in the

1 event the aperture cover is inadvertently closed before the
2 vehicle has completely entered or exited the building;

3 Figure 8 is a side view of one guide track, illustrating
4 the angular relationship between the guide track and the
5 vertical wall containing the aperture.

6

7 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

8 It is to be understood that while a certain form of the
9 invention is illustrated, it is not to be limited to the
10 specific form or arrangement of parts herein described and
11 shown. It will be apparent to those skilled in the art that
12 various changes may be made without departing from the scope
13 of the invention and the invention is not to be considered
14 limited to what is shown in the drawings and described in the
15 specification.

16 With reference to Figure 1, the automatically engaging
17 reinforcement assembly 100 of the present invention is shown
18 in use providing additional support to a building aperture
19 cover, such as a garage door 10. The garage door 10 is
20 illustrated as a generally rectangular, sectional, vertical
21 opening type garage door. The garage door 10 is adapted to
22 form a closure for a generally rectangular opening 12,
23 defined by a vertical wall 14 and horizontal floor 16 of a
24 building, such as a residential garage, for example. The

1 garage door 10 is of substantially conventional construction,
2 except as modified by the present invention, and is typical
3 of vertical opening garage doors. However, the garage door
4 of the present invention may also be utilized in other
5 applications and may have specific design features different
6 from some of the detail features of the door described
7 herein.

8 The door 10 is made up of a plurality of hinged sections
9 or panels. The sections are secured together by spaced apart
10 hinges 32. The hinges 32 are connected to each of the
11 sections adjacent respective lower and upper generally
12 horizontal edges in a conventional manner. Each garage door
13 section has elongated, generally horizontal extending upper
14 edges 20 and lower edges 22, which are formed by folding the
15 upper and lower panel edges and ends to form a somewhat
16 tubular box beam-shaped configuration.

17 The garage door 10 is adapted to be moved from a closed
18 position covering the opening 12 to a substantially open
19 position along opposed guide-tracks 17 (Figure 8, only one
20 side shown), supported on wall 14 adjacent the opening 12.
21 Spaced apart guide rollers 18 are supported on the respective
22 sections and operable to ride in the guide tracks 17 in a
23 conventional manner. The door 10 may be moved between open
24 and closed positions by conventional mechanisms, including

1 counterbalances, springs, and power operated openers (not
2 shown) .

3 Each of the garage door sections is provided with a
4 plurality of spaced apart strengthening members or stiles 18
5 which extend between the upper edges 20 and lower edges 22 of
6 each panel or section 19. The stiles 18 may comprise
7 generally tubular, channel, or flat cross section members
8 which are attached to the door sections faces between
9 embossed sections or alternatively are attached to the
10 horizontal extending upper edges 20 and lower edges 22 of the
11 door sections 19.

12 The garage door 10 is preferably also provided with
13 strengthening members comprising elongated struts or rails 24
14 extending across and suitably secured to the door sections.

15 The guide-tracks 17 may extend at a slight angle from
16 the vertical in order to provide for movement of the garage
17 door 10 away from the wall surface 14 when the door is being
18 moved into an open position (Figure 8). As a result of
19 straight line winds, this slight inclination of the guide-
20 tracks 17 and the outer surface of the garage door 10 will
21 tend to produce a force component on the door, which may tend
22 to "lift" the garage door 10 into an open position.

23 By way of overview, and with additional reference to
24 Figure 2, the reinforcement assembly includes at least one

1 upper anchoring element 26, cooperating with the door header
2 28, and one lower anchoring element 30, cooperating with the
3 floor structure 16. The upper anchoring element 26 utilizes
4 a metal hook and wire rope loop arrangement which includes an
5 adjustable bracket assembly 34, a flexible wire rope loop 36,
6 and a metal hook member 38. The lower anchoring element 30
7 utilizes an engagement pin 40 that extends below the seal 42
8 of the bottom garage door section to cooperate with an anchor
9 plate 44 securely fastened to the garage floor 16. When the
10 garage door 10 is closed, the engagement pin 40 passively
11 cooperates with a bottom anchor plate 44, and the wire rope
12 loop 36 passively cooperates with the metal hook 38, as
13 shown. With this arrangement, the upper and lower anchoring
14 elements automatically maintain the garage door 10 in a
15 secured orientation with respect to the building aperture 12.

16 Referring to Figure 3, the upper anchoring element 26 is
17 shown. The bracket assembly 34 extends vertically from the
18 top strut 46 of the top door panel and includes two metal L-
19 shaped elements 48 and 50, each having one leg adjustably
20 attached to the other via bolts, screws or other suitable
21 fastener well known in the art that would allow vertical
22 adjustment of the bracket assembly 34 with respect to the
23 substantially parallel first 52 and second ends 54. It is
24 noted that the vertical adjustment may be permanently fixed,

1 if desired. The first end 52 of the bracket assembly 34 is
2 suitably attached to the top strut 46 of the garage door 10
3 via bolts, screws, or similar fastener. The wire rope loop
4 36 is preferably constructed from a length of flexible metal
5 strands laid helically about a metallic or non-metallic core
6 having each end attached to the second end 54 of the bracket
7 assembly 34 forming an aperture 56 that aligns vertically
8 with metal hook member 38 securely fastened to the header 28
9 of aperture 12. Alternatively, the wire rope loop may be
10 constructed of other suitable materials well known in the art
11 capable of withstanding the adequate tensile forces. The
12 metal hook member 38 is generally S-shaped and constructed of
13 a suitable metal to withstand the expected forces from the
14 wind-loads. The metal hook member 38 should be suitably
15 attached to the aperture header 28 and positioned so that it
16 substantially aligns and cooperates with the wire rope loop
17 when the garage door 10 is in the closed position and
18 positioned sufficiently from the upper edge of the door
19 section so as to allow clearance for the door 10 when it
20 moves along the guide tracks 16 from a closed position to an
21 open position. In this manner, the metal hook 38 and wire
22 rope loop 36 arrangement reduce door flex and transfer a
23 portion of the load to the structure, thereby reducing the

1 loads placed on existing door-mounting hardware by high wind
2 loads.

3 Referring to Figure 4, the lower anchoring element 30 is
4 shown. The lower anchoring element 30 includes an engagement
5 pin 40 and an anchor plate 44. The engagement pin 40 is
6 suitably attached to a mounting plate 64, such as by
7 weldment, and attached to a vertical intermediate stile 18 of
8 the garage door 10 via bolts, screws, or a similar fastener.
9 Bracing grooves 56 are disposed around the circumference of
10 the first end of the engagement pin 40. The bracing grooves
11 56 engage corresponding aperture edges 58 in the anchor plate
12 44, as a tongue and groove arrangement, when the pin 40
13 shifts laterally during wind loads. The floor mounted anchor
14 plate 44 includes a pin insertion aperture 60 that is sized
15 to accommodate the engagement pin 40. Below the pin
16 insertion aperture 60 and covered by the anchor plate 44 is a
17 relief pocket 62 to allow insertion and proper operation of
18 the engagement pin 40. The engagement pin 40 and mounting
19 plate 44 are preferably constructed from cold rolled steel
20 but may be constructed of other suitable materials well known
21 in the art.

22 Referring to Figure 5, the cooperating tongue and groove
23 arrangement of the engagement pin 40 and the anchor plate 44
24 is shown. As the garage door 10 is subjected to wind-loads,

1 the door may shift forward or backward with respect to the
2 building aperture 12. Positive-pressure wind-loads will tend
3 to force the garage door 10 inward, while negative-pressure
4 wind-loads will tend to pull the door outward. In each case,
5 the engagement pin 40 will be forced against corresponding
6 front or rear edges 58 within the associated anchor plate
7 aperture 60. With this arrangement, the engagement pin
8 groove 56 will engage the corresponding pin aperture edge 58,
9 as a tongue and groove, preventing vertical motion of the
10 door 10 during both positive and negative wind loads.

11 Referring to Figure 6, an alternative embodiment of the
12 engagement pin assembly is shown wherein the mounting plate
13 66 is constructed in the form of an L. The first leg of the
14 mounting plate is provided with fastener slots 68 for
15 attachment and vertical alignment of the engagement pin 40.
16 The engagement pin 40 is preferably attached to the mounting
17 plate 66 by weldment or other suitable fastening means well
18 known in the art.

19 Referring to Figure 7, an alternative embodiment of the
20 engagement pin assembly is shown wherein the engagement pin
21 40 is slidably mounted on the mounting plate. The assembly
22 includes a mounting plate 64 having a guide 70 suitably
23 attached. A stop pin 74 is removably attached to the
24 engagement pin 40 for cooperating with the elongated guide

1 aperture 72. The guide aperture 72 and stop pin 74 limit the
2 travel of the engagement pin 40. A resilient member 78 is
3 attached between the stop pin 74 and a rigidly attached
4 spring pin 76 to resiliently extend the engagement pin 40.
5 In this manner the engagement pin 40 is able to retract in
6 the event that the garage door 10 is inadvertently closed on
7 a vehicle or person.

8 Referring to Figure 8, a side view of the guide tracks
9 17 is shown, illustrating the angular relationship of the
10 guide track 17 to the surface of the vertical wall 14 as
11 described above.

12 In operation, the reinforcement device of the present
13 invention is passively engaged by lowering the garage door
14 10. As the door 10 is lowered into a secured orientation the
15 engagement pin 40 is inserted through the pin insertion
16 aperture 60 located in the floor-mounted anchor plate 44, as
17 the wire rope loop 36 of the upper anchoring element 26 is
18 lowered over the metal hook member 38. As seen with
19 particular reference to Figure 1, the bottom anchoring plate
20 44 is secured to the garage floor 16. and the metal hook
21 member 38 is attached to the door header 28. The device is
22 passively disengaged by raising the garage door 10, thereby
23 reversing the above described actions.

1 Although the invention has been described in terms of a
2 specific embodiment, it will be readily apparent to those
3 skilled in this art that various modifications,
4 rearrangements and substitutions can be made without
5 departing from the spirit of the invention. The scope of the
6 invention is defined by the claims appended hereto.